A proposed new imaging pathway for patients with suspected lung cancer

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
This study evaluated the clinical and financial effects of changing the diagnostic process for patients with lung cancer who were considered medically fit for curative treatment. The authors concluded that using strict clinical and imaging criteria to determine the best diagnostic process, could reduce the time to diagnosis and treatment, without a large increase in costs. The authors' conclusions appear to be appropriate, but the time to diagnosis did not fully capture the health outcomes for the test strategies.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study evaluated the clinical and financial effects of changing the diagnostic process for patients with lung cancer who were considered medically fit for curative treatment.

Interventions
The usual diagnostic process was chest X-ray, computed tomography (CT) scan, then positron emission tomography CT (PET-CT). This was compared with the proposed process of chest X-ray followed by PET-CT.

Location/setting
UK/out-patient.

Methods
Analytical approach:
The economic evaluation was based on one clinical study. The time horizon covered the diagnostic period, which was between seven and 49 days. The authors stated that they took a health service perspective.

Effectiveness data:
The effectiveness data were from a non-randomised retrospective study, that analysed the complete records of all potentially curable lung cancer patients at the Oxford University Hospitals NHS Trust, from 2006 to 2009. The study identified 1,187 patients, 251 of whom fulfilled the predefined inclusion criteria and had imaging between 2006 and 2009. The chest X-rays of included patients were independently analysed by specialist thoracic radiologists who were unaware of the results of any subsequent scans and the final diagnosis. These results were used to evaluate the accuracy of X-ray, with the results of the scans, diagnosis, staging, and treatment. The time spent being diagnosed was estimated using an audit of local practice, in Oxford, and national practice, which was assumed to include a two-week wait for CT imaging, for cancer staging, based on a presentation by the National Clinical Director for Imaging.

Monetary benefit and utility valuations:
Not applicable.

Measure of benefit:
The primary measure of benefit was the potential time saved to a final diagnosis, which did not include beginning treatment. This was estimated from local and national practice, for each diagnostic process.

Cost data:
The costs included clinical attendances, multi-disciplinary presentations, CT scans and PET-CT scans. The number of
PET-CT scans required depended on the results of the chest X-rays. The costs per scan and per meeting were from the Oxford University Hospitals NHS Trust. They were reported in UK £.

Analysis of uncertainty:
Threshold analyses were conducted to determine the PET-CT cost reduction, the underestimation of CT costs, and the patient mix, at which the new diagnostic process became cost equivalent.

Results
The authors found that 96 out of 107 patients with bronchogenic carcinoma that was potentially curable were correctly identified, based on chest X-ray (90% sensitivity). Of 144 patients with bronchogenic carcinoma that was not suitable for curative treatment, or who had an alternative or benign diagnosis, only 91 were correctly identified (63% specificity).

The authors estimated that the new diagnostic process could save one day, compared with the usual local process, or 18 days compared with the usual national process. The new process was estimated to cost £9,562 more that the usual process, which cost £201,200.

The costs were equivalent if the PET-CT cost £180 less, or the CT scan cost £64 more, than estimated.

Authors' conclusions
The authors concluded that it was possible to reduce the time to treatment for patients with suspected lung cancer that was suitable for curative treatment, by using strict clinical and imaging criteria to determine the best diagnostic process, without a large increase in costs.

CRD commentary
Interventions:
The authors described a third imaging pathway, in which patients with suspected lung cancer had a CT scan before their first specialist clinical consultation, but this would not have reduced the time to diagnosis compared with the new process. It was not clear how the local and national processes were estimated, as the local audit was not described. The validity and generalisability of the pathways cannot be evaluated as too little information was reported.

Effectiveness/benefits:
The authors noted that the diagnostic accuracy was not likely to be replicable in practice, as specialist thoracic radiologists would not be available to assess all chest X-rays. A reduction in accuracy could lead to potentially curable patients not receiving treatment. They acknowledged that their analysis did not account for the potential negative effects on the wait for PET-CT scans for other diseases, and a more complete economic evaluation would have analysed the health outcomes of true and false positives and negatives. They noted that faster diagnosis had not been demonstrated to affect tumour size or survival, so there could be no clinical benefit beyond a reduction in anxiety while awaiting diagnosis. The timings for each pathway were from an audit, which was not described, and no evidence was presented for the actual performance compared with the planned pathway. The measure of benefit was limited, as it did not account for true and false positive and negative results and their associated outcomes.

Costs:
The costs were reported at an appropriate level of detail, but their source was not explicitly reported, which limits the assessment of their validity, and the price year was not reported. The authors acknowledged that there could have been some costs and savings that were not captured in their results. They stated that the study did not account for tests that could have been avoided by a more accurate scan earlier in the process, and it did not account for the effects of additional PET-CT scans for lung cancer patients, on the availability of PET-CT scans for other diseases. They acknowledged that the normal pathway had the benefit of limiting PET-CT scans, a relatively scarce resource, to patients who required them.

Analysis and results:
The sensitivity analyses gave no indication of the validity of the original analysis, because there was no way of assessing the validity of the original data. The analysis included no outcomes for the quantity and quality of life, nor for disease progression, indicating that some outcomes important to patients were omitted. The primary outcomes of
reduced wait to diagnosis and treatment, as well as diagnostic accuracy, were not assessed in the sensitivity analysis.

Concluding remarks:
The interventions were well described, and the sources for patient and imaging data were well reported and apparently of high quality. The other data sources and information on the formulation of the pathways were not reported, which makes assessing the validity and generalisability of the analysis difficult. The authors' conclusions appear to be appropriate, but the time to diagnosis did not fully capture the health outcomes for the test strategies.

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